

REMARKS

Claims 2, 8, 11, 16 and 19 were previously canceled. Claims 1, 3, 14 and 15 have been amended. Claims 1, 3-7, 9-10, 11-15, 17-18 and 20 remain in the application. Support for the amendments to the claims is identified herein. No new matter has been added. Reconsideration and allowance of the application is respectfully requested.

Rejection under 35 U.S.C. §112

Claims 3-7 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. This rejection is respectfully traversed for at least the following reasons. As amended herein, claim 1, from which claims 3-7 depend, has been amended herein to no longer contain the limitation "wherein said base arrangement comprises a rotatable base plate". Accordingly, the rejection is now believed overcome and withdrawal of the rejection is requested.

Claims 3-7 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. This rejection is respectfully traversed for at least the following reasons. As amended herein, claim 1, from which claims 3-7 depend, has been amended herein to no longer contain the limitation "wherein said base arrangement comprises a rotatable base plate". Accordingly, the rejection is now believed overcome and withdrawal of the rejection is requested.

Rejection under 35 U.S.C. §103

Claim 15

Claim 15 recites an X-ray source comprising:

- an electron source for emission of electrons in an electron beam, and
- a target for emission of substantially monochromatic X-rays in response to incidence of the electrons of the electron beam onto said target, said target comprising a metal foil of a base arrangement, said metal foil of a thickness of between one and three μm , wherein the metal foil thickness is smaller than or equal to an electron diffusion

depth and for which less than twenty percent (<20%) of electron energy is deposited in the metal foil, said metal foil allowing the generation of high intensity bremsstrahlung X-rays in a direction of transmission of the electron beam and generation of low intensity bremsstrahlung X-rays in a direction of reflection from said target and the base arrangement not allowing the generation of X-rays,

wherein said base arrangement comprises a cooling circuit to allow a coolant to flow along the side of said metal foil opposite to the side on which the electrons are incident, further wherein as a result of the metal foil thickness being smaller than or equal to the electron diffusion depth, more than eighty percent (>80%) of the electron energy is deposited directly into the coolant without exceeding the boiling point of the coolant, and

wherein said target further comprises a carrier having a mean atomic number of less than 10 supporting the metal foil on the side facing the coolant, further wherein a background of the low-intensity bremsstrahlung X-rays on which quasi-monochromatic characteristic lines of the metal foil are superimposed results in a quasi-monochromatic spectrum of X-rays produced on the side of the metal foil on which the electrons are incident and which is opposite to the side of the base arrangement.

Support for the amendment to claim 15 (as well as for amendment to claims 1, 3, and 14) can be found in the specification on at least page 2, lines 32-34; and page 6, lines 1-13 of the application as originally filed.

Claims 15, 17 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Larson** (US 5,602,899). With respect to claim 15, Applicant traverses this rejection on the grounds that this reference is defective in establishing a prima facie case of obviousness.

As the PTO recognizes in MPEP § 2142:

... The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness...

It is submitted that, in the present case, the office action has not factually supported a prima facie case of obviousness for the following, mutually exclusive, reasons.

1. The Reference Does Not Teach the Claimed Subject Matter

The **Larson** patent cannot be applied to reject claim 15 under 35 U.S.C. § 103 which provides that:

A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, since **Larson** does not teach "... a target ... comprising a metal foil of a thickness of between *one and three μm* , wherein the metal foil thickness is *smaller than or equal to* an *electron diffusion depth* and for which *less than twenty percent (<20%) of electron energy is deposited in the metal foil ...* wherein said *base arrangement* comprises a *cooling circuit ...* further wherein as a result of the metal foil thickness being smaller than or equal to the electron diffusion depth, *more than eighty percent (>80%) of the electron energy is deposited directly into the coolant without exceeding the boiling point of the coolant ...*" as is claimed in claim 15, it is impossible to render the subject matter of claim 15 as a whole obvious, and the explicit terms of the statute cannot be met.

In contrast, it is noted that **Larson** discloses an anode assembly for generating X-rays, and in Col. 5, lines 3-4 teaches "[c]oolant flow rate is preferably such as to allow **boiling** ..." [emphasis added] and in Col. 5, lines 16-26 teaches the "film should be as thin as possible for heat transfer, **but thick enough** so that most of the beam energy is

dissipated in the [anode metal] film, not in the diamond ... [t]o minimize wasted energy, the film thickness should be about twice the penetration depth ... Thus a suitable film thickness for the latter beam is about 4 μm ." Accordingly, Larson does not disclose "... a target ... comprising a metal foil of a thickness of between one and three μm , wherein the metal foil thickness is smaller than or equal to an electron diffusion depth and for which less than twenty percent (<20%) of electron energy is deposited in the metal foil ... wherein said base arrangement comprises a cooling circuit ... further wherein as a result of the metal foil thickness being smaller than or equal to the electron diffusion depth, more than eighty percent (>80%) of the electron energy is deposited directly into the coolant without exceeding the boiling point of the coolant ... " as is required in claim 15.

Thus, for this mutually exclusive reason, the burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

2. Prior Art That Teaches Away From the Claimed Invention Cannot be Used to Establish Obviousness

In the present case the **Larson** reference, by providing that the "film should be ... thick enough so that most of the beam energy is *dissipated in the film*" and "[t]o minimize wasted energy, the film thickness should be about twice the penetration depth ..." is directed to an anode metal film with a thickness greater than the penetration depth and for which most of the beam energy is absorbed in the anode metal film. Thus, this system clearly teaches away from claim 15, recited above.

Since it is well recognized that teaching away from the claimed invention is a *per se* demonstration of lack of *prima facie* obviousness, it is clear that the examiner has not borne the initial burden of factually supporting any *prima facie* conclusion of obviousness.

Thus, for this reason alone, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

3. The Combination of References is Improper

Assuming, arguendo, that the above arguments for non-obviousness do not apply (which is clearly not the case based on the above), there is still another, mutually exclusive, and compelling reason why the **Larson** patent cannot be applied to reject claim 15 under 35 U.S.C. § 103.

§ 2142 of the MPEP also provides:

...the examiner must step backward in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made.....The examiner must put aside knowledge of the applicant's disclosure, refrain from using hindsight, and consider the subject matter claimed 'as a whole'.

Here, **Larson** neither teaches, or even suggests, the desirability of the combination since it does not teach the implementation of "... a target ... comprising a metal foil of a thickness of between *one and three μm* , wherein the metal foil thickness is *smaller than or equal to* an *electron diffusion depth* and for which *less than twenty percent (<20%) of electron energy is deposited in the metal foil* ... wherein said base arrangement comprises a *cooling circuit* ... further wherein as a result of the metal foil thickness being smaller than or equal to the electron diffusion depth, *more than eighty percent (>80%) of the electron energy is deposited directly into the coolant without exceeding the boiling point of the coolant* ..." as specified above and as claimed in claim 15.

Thus, it is clear that the Larson patent neither provides any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art to support a 35 U.S.C. § 103 rejection.

In this context, the MPEP further provides at § 2143.01:

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.

In the above context, the courts have repeatedly held that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.

In the present case it is clear that the alleged combination arises solely from hindsight based on the invention without any showing, suggestion, incentive or motivation in either reference for the combination as applied to claim 15. Therefore, for this mutually exclusive reason, the burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn. Accordingly, claim 15 is allowable and an early formal notice thereof is requested.

With respect to claims 17 and 18, the same depend from and further limit, in a patentable sense, allowable independent claim 15 and thus are allowable as well. Withdrawal of the rejection is respectfully requested.

Claim 1

Claim 1 recites an X-ray source comprising:

- an electron source for emission of electrons in an electron beam,
- a target for emission of characteristic, substantially monochromatic X-rays in response to incidence of the electrons of the electron beam onto said target, said target comprising a metal foil of a thickness of between one and three μm and a base arrangement for carrying said metal foil, wherein the metal foil thickness of between one and three μm is smaller than or equal to an electron diffusion depth and for which less than twenty percent (<20%) of electron energy is deposited in the metal foil, wherein the metal of said metal foil has a high atomic number allowing the generation of high intensity bremsstrahlung X-rays in a direction of transmission of the electron beam and generation of low intensity bremsstrahlung X-rays in a direction of reflection from said target and the material substantially included in the base arrangement has a low atomic number not allowing the generation of X-rays, and

- an outcoupling means, which generally only transmits X-rays propagating in the reflection direction of the metal foil over an angular range of $\pm 20^\circ$ antiparallel to the incident direction of the electron beam, for outcoupling a background of the low-intensity bremsstrahlung X-rays on which quasi-monochromatic characteristic lines of the metal foil are superimposed resulting in a quasi-monochromatic spectrum of X-rays on the side of the metal foil on which the electrons are incident and which is opposite to the side of the base arrangement.

Support for the amendment to claim 1 (as well as for amendment to claims 3 and 14) can be found in the specification on at least page 2, lines 32-34; and page 6, lines 1-13 of the application as originally filed.

Claims 1, 3-7, 9, 10, 12-14 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Larson** (US 5,602,899) in view of **Yoshihara** (US 4,238,706). With respect to claim 1, Applicant traverses this rejection on the grounds that these references are defective in establishing a prima facie case of obviousness.

As the PTO recognizes in MPEP § 2142:

... The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness...

It is submitted that, in the present case, the office action has not factually supported a prima facie case of obviousness for the following, mutually exclusive, reasons.

4. Even When Combined, the References Do Not Teach the Claimed Subject Matter

The **Larson** and **Yoshihara** patents cannot be applied to reject claim 1 under 35 U.S.C. § 103 which provides that:

A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, since neither **Larson** nor **Yoshihara** teaches "... a target ... comprising a metal foil of a thickness of between *one and three μm* , wherein the metal foil thickness is *smaller than* or *equal to* an electron diffusion depth and for which *less than twenty percent (<20%)* of electron energy is deposited in the metal foil ..." as is claimed in claim 1, it is impossible to render the subject matter of claim 1 as a whole obvious, and the explicit terms of the statute cannot be met.

In contrast, it is noted that **Larson** discloses an anode assembly for generating X-rays, and in Col. 5, lines 16-26 teaches the "film should be as thin as possible for heat transfer, but thick enough so that most of the beam energy is dissipated in the [anode

metal] *film*, not in the *diamond* ... [t]o minimize wasted energy, the film thickness should be about twice the *penetration depth* ..." Accordingly, **Larson** does not disclose "... a target ... comprising a metal foil of a thickness of between *one and three* μm , wherein the metal foil thickness is smaller than or equal to an *electron diffusion depth* and for which *less than twenty percent* (<20%) of electron energy is *deposited in the metal foil* ... " as is required in claim 1.

Thus, for this mutually exclusive reason, the burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

5. Prior Art That Teaches Away From the Claimed Invention Cannot be Used to Establish Obviousness

In the present case the **Larson** reference, by providing that the "film should be ... thick enough so that most of the beam energy is *dissipated in the film*" and "[t]o minimize wasted energy, the film thickness should be about twice the *penetration depth* ..." is directed to an anode metal film with a thickness greater than the penetration depth and for which most of the beam energy is absorbed in the anode metal film. Thus, this system clearly teaches away from claim 1, recited above.

Since it is well recognized that teaching away from the claimed invention is a *per se* demonstration of lack of *prima facie* obviousness, it is clear that the examiner has not borne the initial burden of factually supporting any *prima facie* conclusion of obviousness.

Thus, for this reason alone, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

6. The Combination of References is Improper

Assuming, arguendo, that the above arguments for non-obviousness do not apply (which is clearly not the case based on the above), there is still another, mutually exclusive, and compelling reason why the **Larson** and **Yoshihara** patents cannot be applied to reject claim 1 under 35 U.S.C. § 103.

§ 2142 of the MPEP also provides:

...the examiner must step backward in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made.....The examiner must put aside knowledge of the applicant's disclosure, refrain from using hindsight, and consider the subject matter claimed 'as a whole'.

Here, neither **Larson** nor **Yoshihara** teaches, or even suggests, the desirability of the combination since neither teaches the specific implementation of "... a target ... comprising a metal foil of a thickness of between *one and three μm* , wherein the metal foil thickness is *smaller than* or *equal to* an *electron diffusion depth* and for which *less than twenty percent (<20%) of electron energy is deposited in the metal foil ...*" as specified above and as claimed in claim 1.

Thus, it is clear that neither patent provides any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art to support a 35 U.S.C. § 103 rejection.

In this context, the MPEP further provides at § 2143.01:

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.

In the above context, the courts have repeatedly held that obviousness cannot be

established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.

In the present case it is clear that the alleged combination arises solely from hindsight based on the invention without any showing, suggestion, incentive or motivation in either reference for the combination as applied to claim 1. Therefore, for this mutually exclusive reason, the burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn. Accordingly, claim 1 is allowable and an early formal notice thereof is requested.

With respect to claims 3-7, 9, 10, 12, 13 and 20, the same depend from and further limit, in a patentable sense, allowable independent claim 1 and thus are allowable as well. Withdrawal of the rejection is respectfully requested.

With respect to claim 14, the same has been amended in a manner similar to the amendment to claim 1. Claim 14 is thus believed allowable over Larson in view of Yoshihara for at least similar reasons. Withdrawal of the rejection is respectfully requested.

Conclusion

Except as indicated herein, the claims were not amended in order to address issues of patentability and Applicants respectfully reserve all rights they may have under the Doctrine of Equivalents. Applicants furthermore reserve their right to reintroduce subject matter deleted herein at a later time during the prosecution of this application or a continuation application.

It is clear from all of the foregoing that independent claims 1, 14 and 15 are in condition for allowance. Dependent claims 3-7, 9, 10, 12, 13 and 20 depend from allowable independent claim 1, and are thus also allowable. Dependent claims 17 and 18 depend from allowable independent claim 15 and are thus also allowable.

Amendments herein are fully supported by the original specification and drawings as discussed herein; therefore, no new matter is introduced. Issuance of an early formal notice of allowance of claims 1, 3-7, 9-10, 11-15, 17-18 and 20 is requested.

Respectfully submitted,



Michael J. Balconi-Lamica
Registration No. 34,291
for David Barnes, Reg. No. 47,407

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Philips Electronics North America Corporation
345 Scarborough Road
Briarcliff Manor, New York 10510
Telephone: 914-333-9693
Facsimile: 914-332-0615
File: NL031185US